



## **1997 STATEWIDE FISH STOCKING PROGRAM**

### **PUT-GROW-AND-TAKE**

**F-81-D-8**

**IDFG 00-30  
JULY 2000**

## **INTRODUCTION**

This report is to meet the compliance standards for the Sport Fish Restoration Grant F-81-D-8 to enhance sportfishing statewide. This report is a compilation of the three hatcheries' annual reports and parts of the Upper Snake Region annual report for the calendar year 1997.

These hatchery programs have produced a very large number of fishes for the anglers of Idaho. Over seven million fish and eggs were produced during 1997 at these hatcheries. The different species raised included three strains of kokanee salmon, two strains of cutthroat trout, and many strains of rainbow trout, brook trout, brown trout, Kamloop trout, fall chinook, and grayling.

## **INTRODUCTION**

Cabinet Gorge Fish Hatchery (CGFH) is located on the south bank of the Clark Fork River in Bonner County, Idaho, approximately eight miles southeast of the community of Clark Fork. The CGFH was constructed in 1985 and was co-funded by Washington Water Power (WWP), Bonneville Power Administration (BPA), and Idaho Department of Fish and Game (Department). The primary purpose for CGFH is to produce late-spawning kokanee salmon *Oncorhynchus nerka kennerlyi* fry for release into Idaho's Lake Pend Oreille. Kokanee fry are needed to mitigate for the loss of wild kokanee recruitment caused by hydroelectric power projects in the Pend Oreille watershed. The kokanee fry release is timed to coincide with cycles of zooplankton blooms.

The CGFH is staffed with two permanent employees. Thirty-three months of temporary labor are available for use during the year. Housing accommodations include two residences for the permanent staff and crew quarters for two temporary employees.

### **Water Supply**

Cabinet Gorge Dam is located about one mile upstream from the CGFH. After its completion in 1952, artesian springs began appearing along the Clark Fork River at the present site of the hatchery. The CGFH water supply consists of approximately 4.4 cfs from a spring and approximately 20 cfs from a wellfield. The temperatures of the lower spring and upper wellfield vary inversely with each other over a 12-month period. The cooler water from the lower springs (pump #7 and #8) was utilized to incubate eggs until January 16, 1997. At that time, a mixture of the two water sources allowed incubation and early rearing water temperatures to be maintained around 50°F (range 48.1°F to 52.5°F). Production water ranged from 39.9°F to 45.6°F.

The CGFH utilizes six pumps to move water to a common headbox. The lower spring and upper wellfield water serves the 31,000 cf of rearing space in the hatchery building and the 1,500 cf of space in the adult holding ponds.

### **Rearing Facilities**

Rearing facilities at the CGFH include 192 upwelling incubators and 64 concrete raceways. The incubators are 12 inches in diameter by 24 inches high, with a maximum capacity of 140,000 kokanee eggs each. The 64 concrete raceways have rearing space of 31,000 cf. The hatchery building encloses approximately one-third of each raceway. The adult kokanee holding area consists of two holding ponds (10-ft x 30-ft each) at the head of the fish ladder. Additional adult holding is available in three holding ponds (10-ft x 30-ft each).

## **PRODUCTION**

Between January 1, 1997 and December 31, 1997, CGFH produced a total of 3,746,571 fish weighing 8,363 lbs (Appendix 1). On January 1, 1998, a total of 601,661 Lake Pend Oreille kokanee eggs and newly hatched fry were on hand (Appendix 2). In addition, a total of 101,115 fall chinook salmon, 180,404 kamloop trout, and 1,003,378 rainbow trout eggs and newly hatched fry were on hand.

A total of 8,594 lbs of feed produced 7,510 lbs of gain for an overall feed conversion of 1.14. Total production cost (less capital outlay) was \$223,820, resulting in a cost per lb of fish of \$26.76, cost per inch of fish of \$0.0311, and \$59.74 per thousand fish (Appendix 1).

### **Lake Pend Oreille Kokanee**

#### **General Rearing**

Fertilized eggs were brought to the CGFH and disinfected in 100-ppm PVP iodine for 15 minutes. After enumeration by volumetric displacement, the green eggs were placed into upwelling incubators and rolled until eye-up. At eye-up the eggs were shocked, sorted, and counted with the Jensorter JHC-114 model sorter. Fry were allowed to swim out of the incubators into the raceways at 1,550 to 1,580 temperature units (TUs). All fry were thermally mass-marked via temperature manipulation in the raceways. Feed training began at 1,680 to 1,720 TUs.

Kokanee were feed-trained for 17 days at approximately 50°F using Rangen Trout and Salmon starter. Feed training continued from the 18<sup>th</sup> day to the 34<sup>th</sup> day utilizing a 50:50 mix of Trout and Salmon starter and Trout and Salmon starter #1. On day 35 the fry were placed on Trout and Salmon starter #1 only. The fry remained on Trout and Salmon starter #1 until they reached an average size of 800 fish per lb. The fry were then placed on Trout and Salmon starter #2 for the remainder of the rearing season. Release size objectives have changed from about 1.3 fry inches (1986) when the CGFH began operations to the present request of a 2-inch average size at release. To meet the request, the CGFH capacity has been reduced from 30 million fry to 16 million fry.

Egg collection lasts over two months, and a cross-section of the run is required for each release strategy. Growth rates were not manipulated during the 1997 season to achieve a universally sized 2-inch fry. The fish were reared using 42 monthly TUs per inch of growth. For the third consecutive season, fish were not taken off feed or overfed to attain the average 2-inch size parameter at release. After approximately 6 weeks of feed training, the fry were extended in the raceway, and water temperatures were lowered to emulate natural production in Lake Pend Oreille. It should be noted that during the spring and early summer of 1997 the Clark Fork River rose to unusually high levels. On May 14, 1997 flows in the Clark Fork River exceeded 115,000 cfs, the lower springs pumping station was shut down, and the pumps were removed. The river continued to rise and peaked at approximately 139,000 cfs. As a result, the overall effect was that the average incubation and production water temperatures dropped

from 49.3°F to 40.1°F and from 45.6°F to 40.1°F, respectively. The overall decrease in temperature resulted in a slightly smaller average size at release of 465 fish per lb (331 fish per lb in 1996).

A total of 3,722,167 kokanee fry were produced at an average length of 1.93 inches and an average weight of 465.13 fish per lb. These fish gained 7,352 lbs from 8,471 lbs of feed, resulting in a conversion rate of 1.15:1.0. Fish feed production cost was \$27.57 per lb, \$0.0307 per inch, and \$59.27 per thousand.

Survival of green eggs to feeding fry was estimated at 83.9% (1996, 88.2%). Survival from first feeding to release was estimated at 98.8% (1996, 98.0%), resulting in survival from green egg to release of 82.9% (1996, 85.5%).

## **Fish Marking**

To evaluate the success of a kokanee stocking program in Lake Pend Oreille, an otolith thermal mass-marking (Volk, et al. 1990) program was initiated at CGFH. All kokanee fry received a thermally induced otolith pattern.

Otolith marking normally occurs between eye-up and button-up stages, but plumbing at CGFH precluded normal procedures due to its inability to accommodate supplying two water sources of different temperatures to the incubating eggs and sac fry. The incubation vessels, however, allowed for volitional swim-up of fry into separate rearing raceways, which were plumbed to accommodate a Tmarking program. This situation provided the impetus to attempt Tmarking fry at the end of button-up.

Analysis of pre-release voucher specimens (Grimm, et al. 1997) verified the presence of a recognizable otolith mark on all thermally treated fry. Although there was significant variability in the expression of the Tmark, ambiguous marks could be confirmed by carefully observing incremental patterns at the measured area where the Tmark was expected to occur.

Two factors contributed to the success of the Tmarking and recovery of the Tmarks. The first was the ability to manipulate water sources separately in each raceway without affecting the water in the other raceways. The second was the short (less than seven days) spread of the egg takes that were in each raceway. These factors allowed CGFH personnel to thermally treat groups of fry that collectively were at the same developmental stage. That is important because it places the otolith pattern in relatively the same geographic region of the otolith, making examination for and recovery of the mark much easier.

The Tmarks were recoverable but more variably expressed than expected. Some were very clear and easy to see while some were more cryptic. Creating and recovering the Tmark for the 1996 CGFH kokanee brood was successful. Adjustments to spacing between thermal events will be made to the 1997 brood Tmarking effort to create artificial patterns less similar to natural daily increments patterns.

Trawl surveys in Lake Pend Oreille were conducted from September 29 to October 4, 1997. Fry were collected from three areas of the lake. All age-0 fry collected were sent to the Washington Department of Fish and Wildlife otolith lab for analysis. By examining their otolith (earstones), they were able to determine wild fry from hatchery fry. Hatchery fry made up 53% of the sample while wild fry made up the remaining 47%. Trawl results from the three collections are listed below:

<u>Sample</u>	<u>Marked</u>	<u>Unmarked</u>	<u>Total</u>	<u>% Marked</u>
S1	45	78	123	37
S2	54	25	79	68
S3	69	47	116	59
Totals	168	150	318	53

The success of the program has been encouraging. The most beneficial part of the program is that it is cost-effective. A total of 3.7 million fry were Tmarked and no additional costs were required. In the next two years it will be possible to improve estimates of this year class of fish in Lake Pend Oreille.

## **Fish Liberation**

On July 2, 1997, 1,004,687 fish were released from the CGFH into the Clark Fork River. On June 25-26, 1997, 2,716,010 kokanee fry were released into Sullivan Springs.

Numbers at release were based upon Jensorter counter/sorter inventory numbers at eye-up, minus mortality. All fish were off feed for three full days before inventory pound counts were taken. Pound counts were completed on all raceways one to three days prior to fish being loaded onto the transport vehicles, or being released into the Clark Fork River. All raceways were displaced onto the transport trucks during the Sullivan Springs release to double-check inventory numbers. Weight displacements were performed to support current fish inventory numbers on hand at the time of release. No weight displacements were conducted prior to releasing the fish into the Clark Fork River via the fish bypass system.

The Clark Fork River release groups were liberated at night directly into the ladder via the fish bypass system. Only three raceways were released at one time. The entire release took less than two hours.

The Sullivan Springs release group was transported in one Department tanker (3,000-gal capacity). Loading densities of small fish in the tankers was kept below 0.60 lbs per gal. Fish were planted below the bridge on the access road to the Department patrol cabin. One tanker made four releases during the period of June 25-26, 1997.

## **Other Species**

On February 19, 1997, a total of 22,240 fall chinook salmon were transported from CGFH to the Nampa Fish Hatchery. The fish averaged 880 fish per lb and had attained a length of 1.49 inches.

On May 5, 1997, a total of 132 Kootenai River sturgeon were transported from CGFH to Hagerman National Fish Hatchery (University of Idaho Research Facility). The fish averaged .47 fish per lb and had attained a length of 22 inches.

On June 8, 1997 and June 26, 1997, a total of 600 kamloop trout and 96 westslope cutthroat trout were given to Perimetrics, Inc. and sacrificed for experimentation. The fish were 25 fish per lb and 26 fish per lb and had attained a length of 4.65 inches and 4.79 inches, respectively.

On July 3, 1997, a total of 1,470 kokanee salmon were planted into Mirror Lake. The fry averaged 3,691 fish per lb and had attained a length of .97 inches. The fry were back-up experimental fish that were not used by University of Idaho researchers. The fry were released into Mirror Lake because they did not receive a thermally induced temperature mark during early rearing.

On July 3, 1997, a total of 1,336 kamloop trout were planted into Hayden Creek. The fish averaged 49 fish per lb and had attained a length of 3.71 inches.

## **HATCHERY IMPROVEMENTS**

### **Repairs and Improvements**

- Occupation Safety and Hazard Administration (OSHA) safety materials purchased in 1995 with capitol outlay funds were installed during the summer of 1997. Most of the project is completed with the exception of the guardrails protecting pumps #7 and #8. High water and the erosion of the bank around pumps #7 and #8 prohibited the project from being completed. Repairs were made around the pumps during the fall of 1997 and the project will be completed during the spring of 1998.
- The generator #2 building (constructed in 1995) and the Generac generator (purchased in 1996) were placed in operation on October 28, 1997. The generator was load-tested and operational instructions were confirmed.
- Backyard fencing material (purchased in 1995) was installed during 1997. Both residence #1 and residence #2 had the backyards fully enclosed with fences and gates. The materials replaced a low wooden fence, which was in need of repairs.

- The generator #1 trickle charging system was reinstalled. It had been disconnected in the past and was never repaired and replaced. The disconnection caused the generator batteries to go bad and affected the level of power required for the monitoring panel to operate effectively. When the power level was reduced to the panel the generator not only would not start but the alarms were inoperative. Four new batteries were purchased to replace the old batteries.
- Envirosearch removed the 2,000-gal underground diesel storage tank on August 6, 1997 to comply with changing UST regulations. A new 500-gal above ground diesel fuel tank was purchased and installed during the fall of 1997. The new tank supplies fuel to both generator #1 and generator #2 independently of one another via generator #1 and generator #2 day tank pumps.
- The raceway #7 wall was repaired. In addition, the concrete slab for the new diesel fuel tank was completed and a power washing concrete slab was poured at the west end of the hatchery building.
- All department vehicles, tractors, and small engines were serviced regularly and repaired as needed.
- Back-up generator #1 was load-tested weekly and maintenance-checked daily during operations. Generator #2 was operated weekly (with no load) and load-tested monthly (with pump #8 only).
- The rain gutters were repaired on residence #1 and residence #2. The heavy snowfall during the winter of 1996-1997, and the ice that formed destroyed most of the existing gutters.
- Modifications to the Sullivan Springs/Granite Creek finger weir and dividing weir were completed during the fall of 1997. The finger weir and dividing weir were modified so that pins instead of nuts and bolts, or lags could be used. The modification dramatically decreased the time required to remove the two structures.
- New raceway dam boards were purchased with CGFH funds to replace the old, original dam boards.
- All of the CGFH fire extinguishers received annual servicing.
- All of the upwelling incubator raceway hangers were modified to create a stronger, more reliable hanger. An additional piece of metal was welded at the weak point to give it additional strength.
- A new feed storage building was constructed with capitol outlay funding. A total of \$7,000 was available and the building was constructed for less than \$6,000. The building is 16-ft x 20-ft and will house up to 30,000 lbs of feed.
- A new smoke alarm, backboard, and medical kit were purchased for the Granite Creek trap to comply with OSHA recommendations.



- Supplies for the new headbox catwalk were received during 1997. The new catwalk will be installed during the summer of 1998. The electrical conduit supplying power to the alarm system needs to be moved and reinstalled before the project can be completed.
- The Kubota tractor snowblower attachment was repaired during the summer of 1997.
- Two new file cabinets were purchased during September 1997.
- A log structure in Sullivan Springs was repaired on October 14, 1997.

## **HATCHERY RECOMMENDATIONS**

Inadequate amounts of available warm water (50°F) during the production months remains the limiting factor for fish production. Although the upper wellfield can yield up to 20 cfs, it is too cold during the production cycle. Warmer water from the lower springs must be added to temper the upper wellfield water. Unfortunately, only 4.4 cfs is available from the lower springs. It has been proposed that an additional pumping station be installed on the lower spring's pipeline to help lift or push the water up to the CGFH headbox. The additional station could add approximately 1.6 cfs of warm water to the current system. The lower springs collects approximately 6 cfs of available water but the means to pump it is unavailable. Currently generator #1 backs up a total of 19.4 cfs (pumps #8, #7, #6, #5, and #4) and a total of 7.2 cfs is backed up by generator #2 (pumps #3 and #8).

## **FISH SPAWNING**

### **Fish Trapping**

The Clark Fork River fish trap was in operation from September 11, 1997 to January 2, 1998. The first adult kokanee entered the trap on October 9, 1997, and trapping and spawning continued through early January. There were 70 adult kokanee trapped. Spawntaking records indicated 50% of the spawning run was female (35). From September 11, 1997 to October 20, 1997 the trap was used to collect and sample bull trout. A total of 15 adult bull trout were trapped. The length of the fish ranged from 530 cm to 770 cm. A total of six males and nine females were trapped. One male mortality was recorded on September 29, 1997. All of the adult bull trout had a tissue sample removed. In addition, all of the adults, with the exception of one female, were tagged. Two of the females and three of the males were previously marked with a right ventral fin clip.

The Sullivan Springs trap was in operation from October 20, 1997 to December 30, 1997. The trap collected 16,134 adult kokanee salmon. Of these, 6,320 adults were passed above the trap to spawn naturally in Sullivan Springs Creek. Spawntaking records showed that 24.75% of the run was female.

## **ACKNOWLEDGMENTS**

The CGFH staff would like to thank the Cabinet Gorge Dam personnel for their continued cooperation with hatchery operations. Thanks also to the Lake Pend Oreille Idaho Club, Bonner County Sportsmen's Association, numerous volunteers, and various regional and hatchery Department personnel for their cooperation during the spawning season.

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- Grimm, J.J., L.C. Nguyen,, and E.C. Volk,, 1997. Results of Idaho Department of Fish and Game 1997 Lake Pend Oreille Kokanee Otolith Thermal Mark Recovery, Brood Year 1996 Kokanee. Washington Department of Fish and Wildlife Otolith Laboratory.

Appendix 1. Production summary for Cabinet Gorge Fish Hatchery, all species, 1997.

Species	Number	Pounds	Length	Fish/lb	Feed	Feed	Annual	Cost	of fish	Cost/1000	Cost/inch
					Fed	Cost	Cost		fish		
PDO kokanee	3,722,167	8,002	1.93	465	8,471	\$5,421.44	\$220,616.62	\$27.57	\$59.27	0.0307	1.15
Fall chinook	22,240	25	1.49	881	14	\$8.64	\$351.59	\$13.92	\$15.81	0.0106	1.06
Kootenai sturgeon	132	281	21.99	0.47	60	\$38.08	\$1,549.60	\$5.51	\$11,739.42	0.5339	0.55
Outthroat trout	96	4	4.79	26	3	\$1.73	\$70.32	\$19.06	\$732.48	0.1529	0.83
Kamloop trout	1,936	51	4.04	38	47	\$30.27	\$1,231.87	\$24.15	\$636.30	0.1575	1.09
<b>Totals/Average</b>	<b>3,746,571</b>	<b>8,363</b>	<b>1.92</b>	<b>448</b>	<b>8,594</b>	<b>\$5,500.16</b>	<b>\$223,820.00</b>	<b>\$26.76</b>	<b>\$59.74</b>	<b>0.0311</b>	<b>1.14</b>

Appendix 2. Lake Pend Oreille kokanee spawntaking summary, Cabinet Gorge Fish Hatchery, 1997.

Spawntaking site	Total fish	Females spawned	Green eggs	Fecundity	Percent females
Sullivan Springs	16,134	2,241	593,810	265	24.80%
Cabinet Gorge	70	35	7,851	224	50.00%
<b>Totals/Average</b>	<b>16,204</b>	<b>2,276</b>	<b>601,661</b>	<b>264</b>	<b>24.90%</b>

Total fish includes male/female prespawn mortality.

## 1997 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management F-71-R-22

Project I: Surveys and Inventories

Subproject I-G: Upper Snake Region

Job: Henrys Lake

Title: Lowland Lakes Investigations

Contract Period: July 1, 1997 to June 30, 1998

### ABSTRACT

The 1997 spawning operations at Henrys Lake produced 1,651,182 eyed cutthroat trout eggs, 1,23,760 eyed hybrid trout eggs, and 485,913 eyed brook trout eggs. Cutthroat trout in the Hatchery Creek run averaged 441 mm, hybrid trout averaged 472 mm, and brook trout averaged 305 mm. Catch composition in six net nights of gill netting at Henrys Lake was 42% cutthroat, 37% hybrid, 17% brook trout, and 4% Utah chubs.

Pathology tests did not detect *Myxobolus cerebralis* in Henrys Lake cutthroat trout in 1997. *Myxobolus* spores were detected in one of 12 five-fish brook trout pools, and confirmed as *M. cerebralis* by histology.

Angling effort on Henrys Lake in 1997 totaled 228,952 hours. Mean season catch rate was 0.54 fish/hour, with an estimated total harvest of 32,415 fish. Catch composition was 51% cutthroat trout, 46% hybrid trout, and 3% brook trout. Mean size in the harvest was 427 mm, 434 mm, and 389 mm, respectively.

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## **METHODS**

### **Henrys Lake**

#### **Spawning Operation**

The Hatchery Creek fish ladder was opened on March 5 and remained in operation until April 25. Fish ascending the ladder were identified as cutthroat or hybrid trout and enumerated. A sub-sample of approximately 10% of each group was measured (fork Length - mm). Hybrid trout were produced with cutthroat trout eggs and Kamloops rainbow trout sperm obtained from Hayspur Hatchery. Cutthroat trout males and females were spawned to produce cutthroat trout for supplemental stocking in Henrys Lake and other Idaho fisheries.

On October 3 Ashton Hatchery personnel began a morpholine drip in the Henrys Lake Hatchery spawning facility. From October 10 through November 14 the fish ladder was opened to collect spawning brook trout. Fish entering the trap were sexed, enumerated, and measured. Spawning methods differed from previous years. Gametes were taken and pooled into groups of five at the spawn house. Oxygen was added to bags containing pooled sperm, and both egg and sperm bags were transported in coolers to Ashton Hatchery. At Ashton ovarian fluid samples were taken, the eggs were fertilized, disinfected, enumerated, and placed into Heath stacks for incubation.

Disease samples were taken from both spawning runs. Ovarian fluids were collected from cutthroat during spawning at Henrys Lake Hatchery. A mixed-sex group of 60 adult cutthroat trout were also sacrificed for disease testing. All samples were sent to the Eagle Laboratory. Brook trout ovarian fluid samples were obtained at Ashton Hatchery prior to egg fertilization, and 50 adult male brook trout were sacrificed from the spawning ladder.

#### **Gillnetting**

On May 21-22, gill net samples were collected from six standardized sampling locations (total six net nights). Nets were set at dusk and retrieved the following morning. Captured fish were identified to species, measured, and weighed.

#### **Creel Census**

Henrys Lake Hatchery personnel performed a randomized structured creel survey throughout the fishing season. Survey structure followed the protocol of previous creel censuses on Henrys Lake. Creel clerks did angler counts and interviews, and identified, measured, and recorded clips on all fish observed in the creel. We entered and analyzed data using the Department creel census program.

## **Limnology**

Late winter (January to March, 1998) dissolved oxygen concentrations were assessed at established sampling sites throughout Henrys Lake. In addition, data from previous years were compared to 1998 data to describe trends in winter oxygen depletion at established sampling locations.

## **Sterile Hybrids**

In March 1996, Research personnel heat-shocked approximately 70,000 rainbow x cutthroat hybrid eggs to induce triploidy (Dillon and Alexander 1997). Another 30,000 hybrids eggs served as controls. All were reared at Ashton Hatchery. Blood work indicated 46% triploidy in treatment groups. Treatment and control fish were given left and right pelvic fin clips, respectively. Two thousand of each group were stocked into the East Harriman Pond in September, 1996.

In March of 1997, Research personnel modified heat shock treatments and again attempted to produce triploid hybrids. These fish were reared along with controls at Grace Hatchery. One treatment (27°C, 10 minutes after fertilization, 10 minute duration) provided a 70% triploidy rate. Treatment and control fish were given left and right pelvic clips, and stocked (2,000 each) into the East Harriman Pond in September 1997.

We sampled the East Harriman Pond in August 1997 to assess relative performance of sterile triploid and control diploid hybrids from brood year 1996. We used a combination of floating experimental gill nets and electrofishing to collect fish. We recorded total length and clips of all hybrids, and took blood samples from each hybrid to verify ploidy level. Blood samples were sent to Washington State University for analysis.

## **RESULTS AND DISCUSSION**

### **Henrys Lake**

#### **Spawning Operation**

A total of 5,844 cutthroat trout (3,172 males and 2,672 females) ascended the spawning ladder between March 5 and April 24 (Figure 4). Hybrid trout totaled 2,380 fish, 633 males and 1,747 females. Mean length for male and female cutthroat was 443 and 439 mm, respectively (Figure 5). Combined average cutthroat trout length was 441 mm. Hybrid trout males and females averaged 480 and 468 mm, respectively (Figure 6). Combined average hybrid trout length was 472 mm.

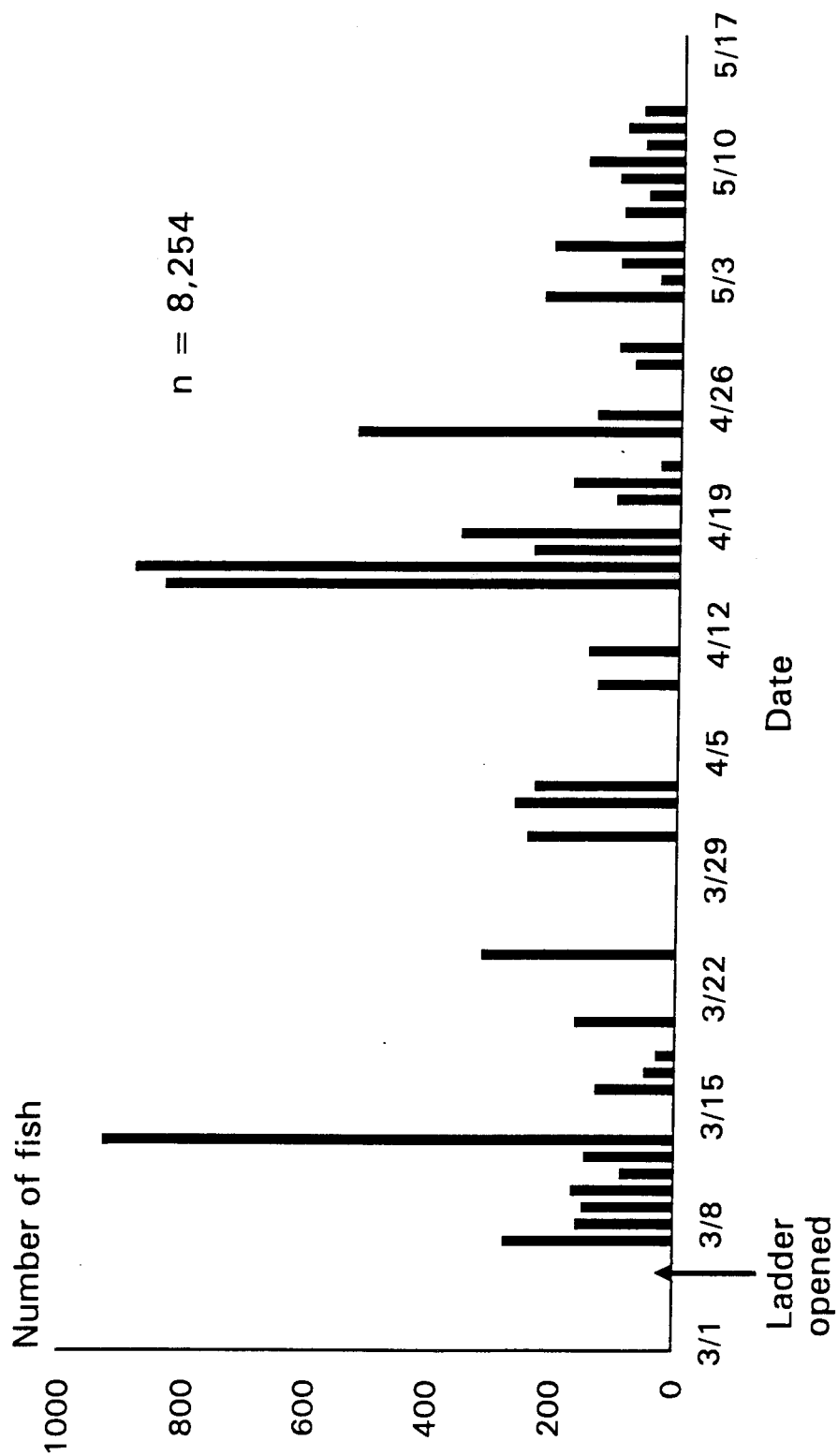


Figure 4. Run timing for cutthroat and hybrid trout ascending the Henrys Lake spawning ladder, 1997.



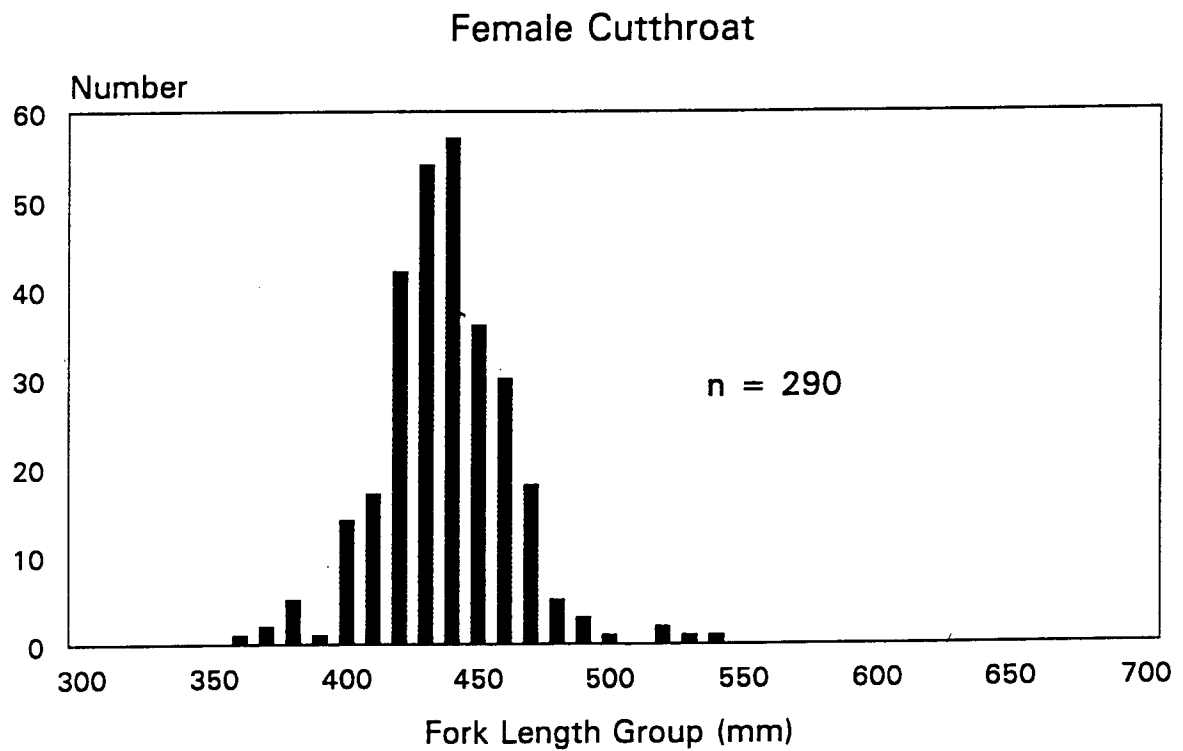
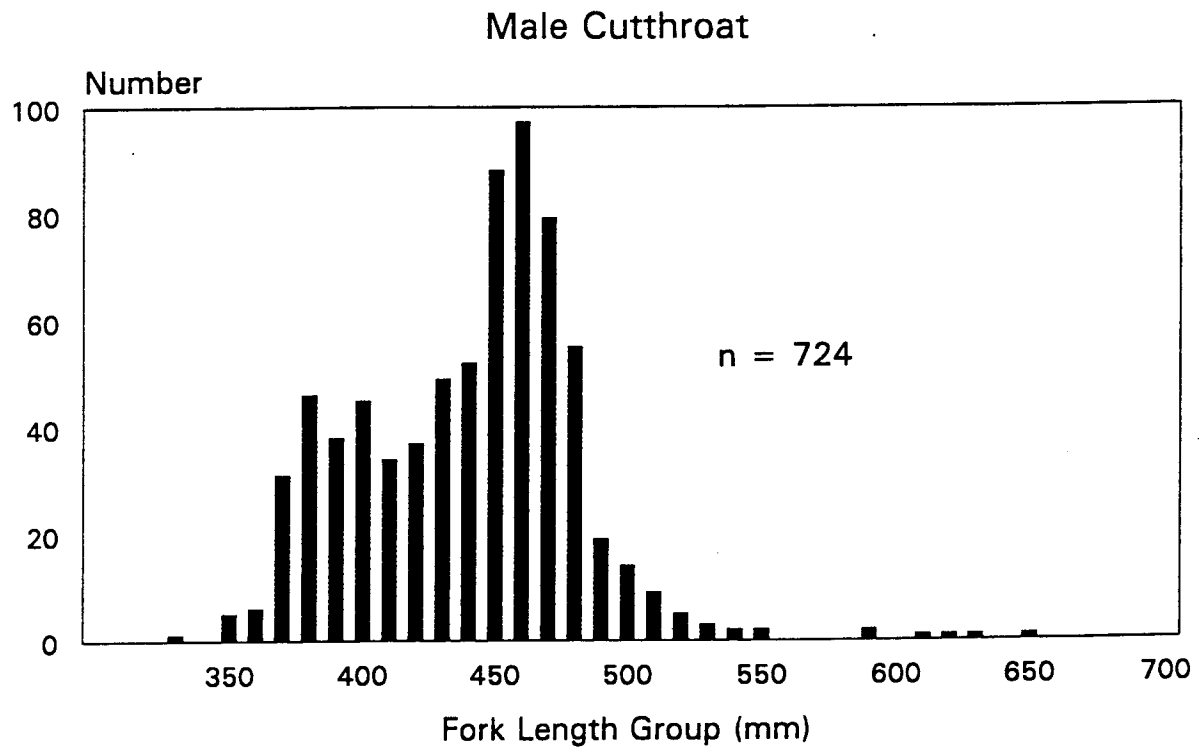


Figure 5. Length frequency (fork length) of male and female cutthroat trout in the Henry's Lake Hatchery spawning run, 1997.

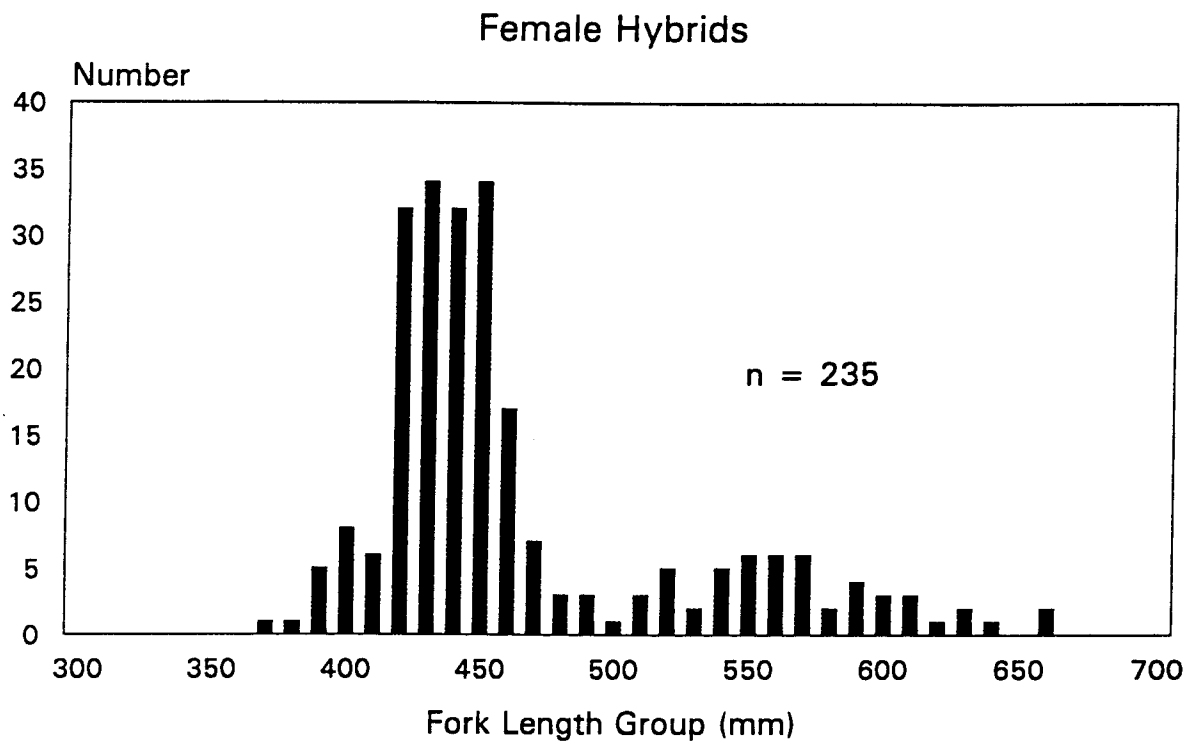
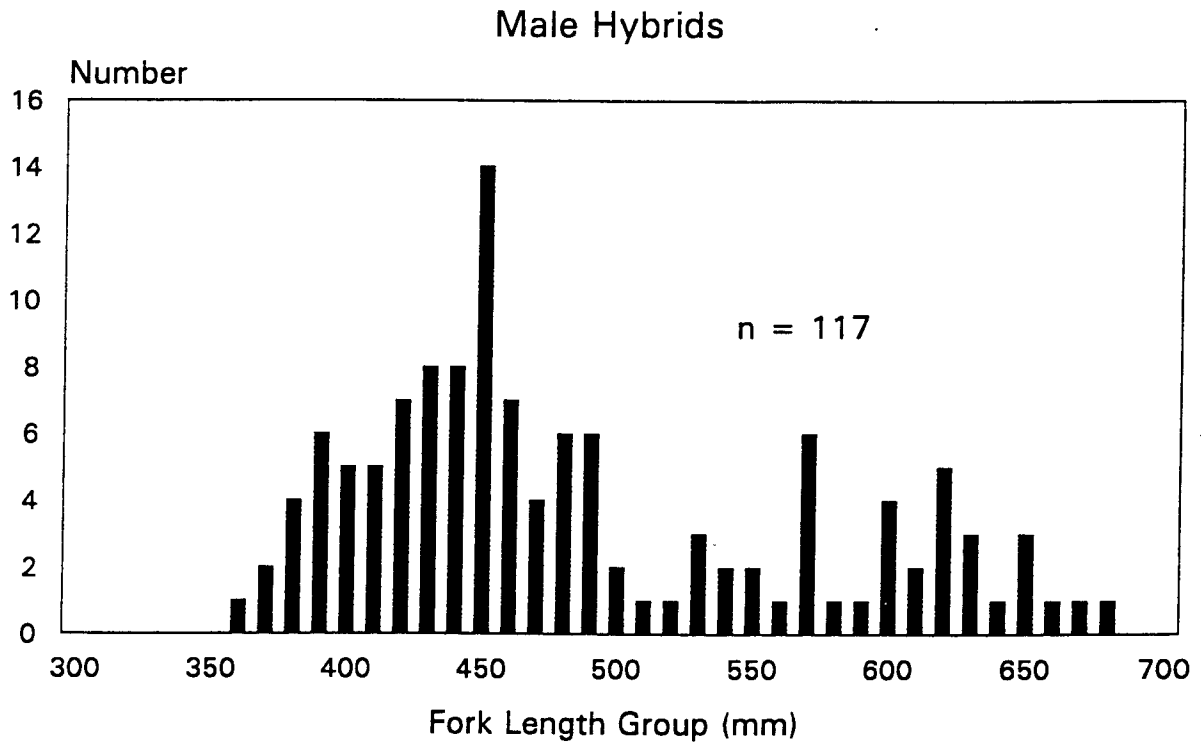


Figure 6. Length frequency (fork length) of male and female hybrid trout in the Henry's Lake Hatchery spawning run, 1997.

Cutthroat green eggs totaled 2,218,680 from 1,047 females for an average fecundity of 2,119 eggs per female. Eyed cutthroat eggs totaled 1,651,182 for an overall eye-up rate of 74.4%.

Hybrid trout green eggs totaled 1,611,800 from 907 cutthroat trout females for an average fecundity of 1,777 eggs per female. Eyed hybrid trout eggs totaled 1,236,760 for an overall eye-up rate of 76.7%.

From October 10 through November 14 a total of 1,672 brook trout (920 males and 669 females) ascended the fish ladder (Figure 7). Male and female brook trout averaged 293 and 314 mm for a combined average of 305 mm.

Brook trout green eggs totaled 641,234 from 401 females for an average fecundity of 1,599 eggs per female. Eyed eggs totaled 485,913 for an overall eye-up rate of 75.8%.

Cutthroat trout ovarian fluid disease samples showed no viral pathogens, and a low level of potential bacterial pathogens. In the twelve pooled samples of adult cutthroat trout, no *Myxobolus* spores were detected by the digestion method, although this population was confirmed positive for *M. cerebralis* in 1996.

No pathogens were detected from brook trout ovarian samples. In adult brook trout samples, *Myxobolus* spores were detected by the digestion method in one of twelve pooled samples. For the first time, histology was able to confirm the species as *M. cerebralis*.

## **Gillnetting**

A total of 119 fish were collected in the six net nights (total soak time 112.5 h). Catch composition was 42% cutthroat trout, 37% hybrid trout, 17% brook trout, and 4% Utah chub (Appendix C). Cutthroat trout ranged from 220 to 510 mm total length, hybrids 100 to 510 mm, and brook trout 130 to 420 mm. Brook trout contribution to gill net catches increased from 3.4% in 1995 and 9.4% in 1996. Sample size for Utah chubs was small (n=5) but appeared to contain two age-classes, with two fish 150 to 160 mm and three fish 250 to 270 mm.

## **Creel Census**

Anglers fished an estimated 228,952 hours on Henrys Lake in 1997 (Table 4). Mean season catch rate was 0.54 fish/hr. An estimated 32,415 fish were harvested with harvest comprised of 51% cutthroat, 46% hybrids, and 3% brook trout. Mean size in the harvest was 427 mm, 434 mm, and 389 mm, respectively.

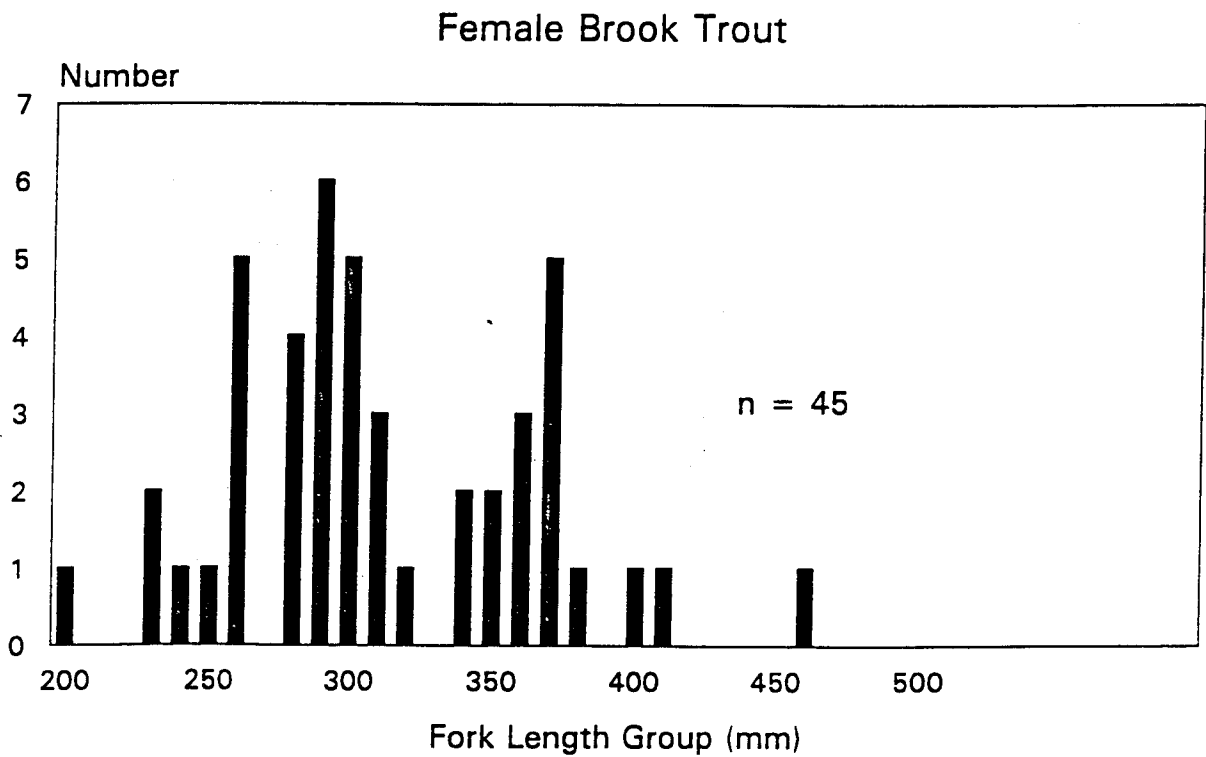
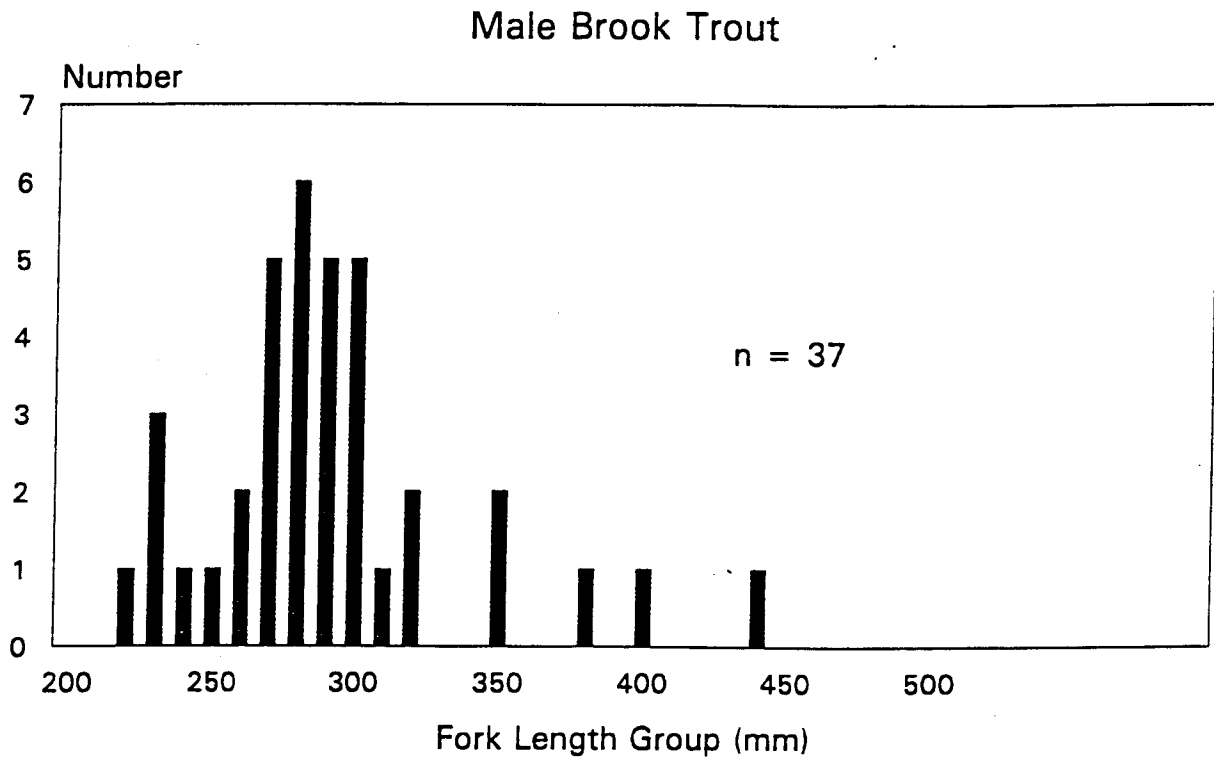


Figure 7. Length frequency (fork length) of male and female brook trout in the Henry's Lake Hatchery spawning run, 1997.

Table 4. Summary data for the 1997 creel census on Henrys Lake.

Total angling effort (hrs)	Effort and Catch			% Released
	Harvest	Harvest rate (fish/hr)	Catch rate (fish/hr)	
228,952	32,415	0.25	0.54	74%

Harvest Composition		
Cutthroat	Hybrid	Brook
51%	46%	3%

Sizes Observed in the Creel				
	Mean size (in)	%>20in	Number >20in	Total harvest
Cutthroat	16.8	6.8	12	14,810
Hybrid	17.1	20.2	35	14,387
Brook	15.3	9.1%>18in	6 >18in	1,263

## **Limnology**

Dissolved oxygen data for January to March 1998 are presented in Appendix D. Oxygen levels were sufficient to provide adequate overwintering habitat in Henrys Lake. The aeration system was not used. Within the ranges observed, dissolved oxygen levels declined at a relatively constant rate throughout the January to March monitoring period (Figure 8). Winter oxygen levels also appear to be influenced by water levels going into the winter. In winters following drought years (e.g. 1992, 1993) January-March oxygen levels were consistently lower than in winters following wet years (1997, 1998; Figure 8). We may be able to predict likelihood of winter-kill based on January oxygen levels, but further analyses are required to develop this predictor.

## **Sterile Hybrids**

We sampled a total of 20 hybrids from the East Harriman Pond (Table 5). Of these, 12 were from the treatment group and seven were controls. Of the 12 treated fish, seven were confirmed triploid by blood analysis (Paul Wheeler, Washington State University, personal communication). Mean length of confirmed triploids was 277 mm, and mean length of diploids was 260 mm (Table 5).

Sterile triploid hybrids, if they perform as well as normal hybrids, represent a management tool to maintain the trophy component of the Henrys Lake fishery while protecting genetic integrity of the native Yellowstone cutthroat. Although the current data suggest no difference in growth, evaluations in the East Harriman Pond should continue through at least 1998. We will also continue to develop heat-shock treatments to improve triploidy induction rates. If performance of sterile triploid hybrids is comparable to normal fertile hybrids, all of the hybrid production for Henrys Lake should eventually be heat-shocked to produce triploids.

## **RECOMMENDATIONS**

### **Henrys Lake**

1. Continue annual standard gill net surveys to describe population trends. Use additional gill netting and/or trap netting to monitor distribution and status of Utah chub population.
2. Continue experimental sterile hybrid project. Evaluate performance in East Harriman Pond.
3. Use existing winter oxygen data to develop a predictor of winter kill risk based on January dissolved oxygen levels winter aeration operations manual to provide guidelines for use of aeration system.

# One mile South of Pittsburg Creek

## Dissolved Oxygen Levels

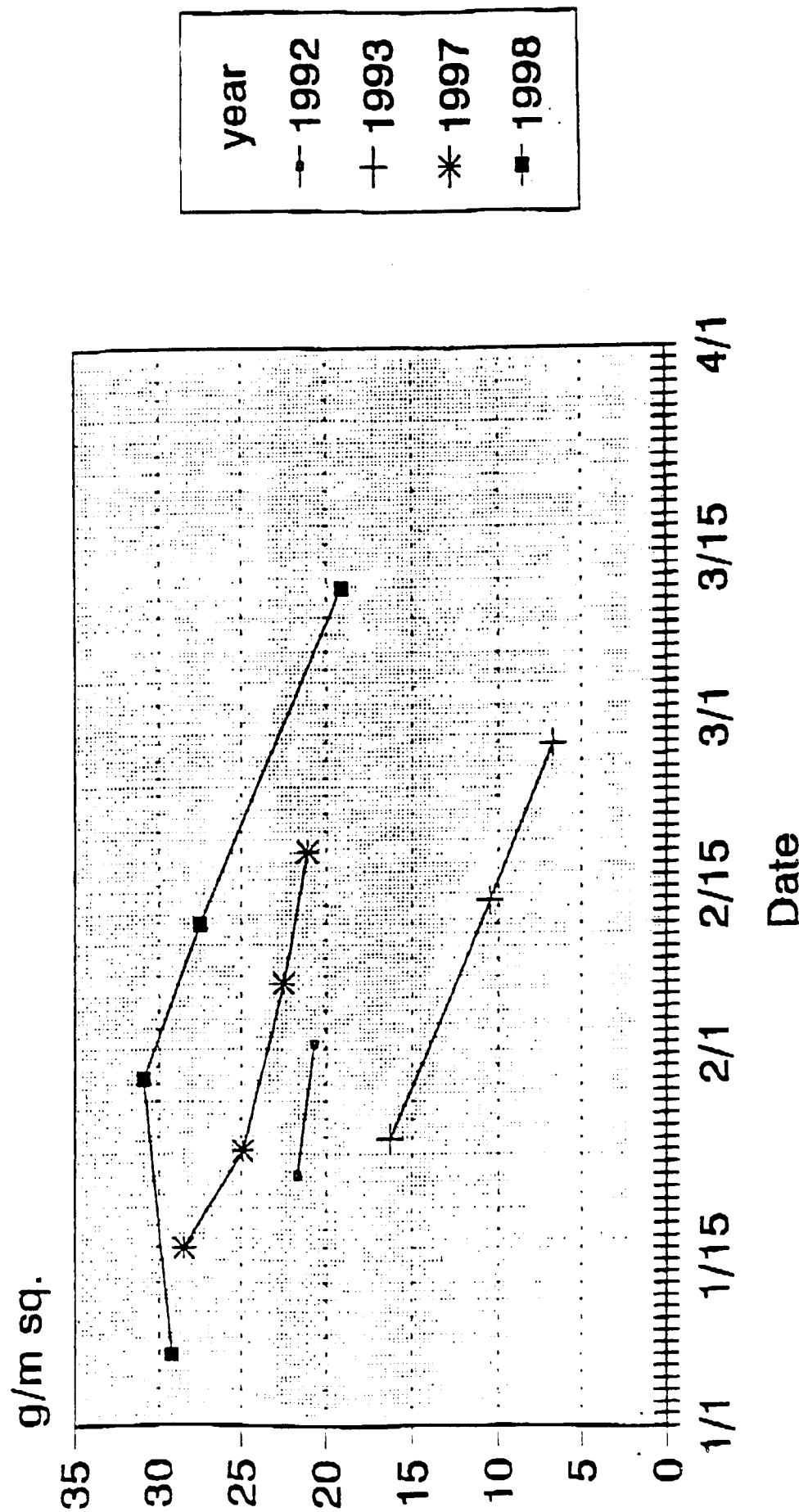
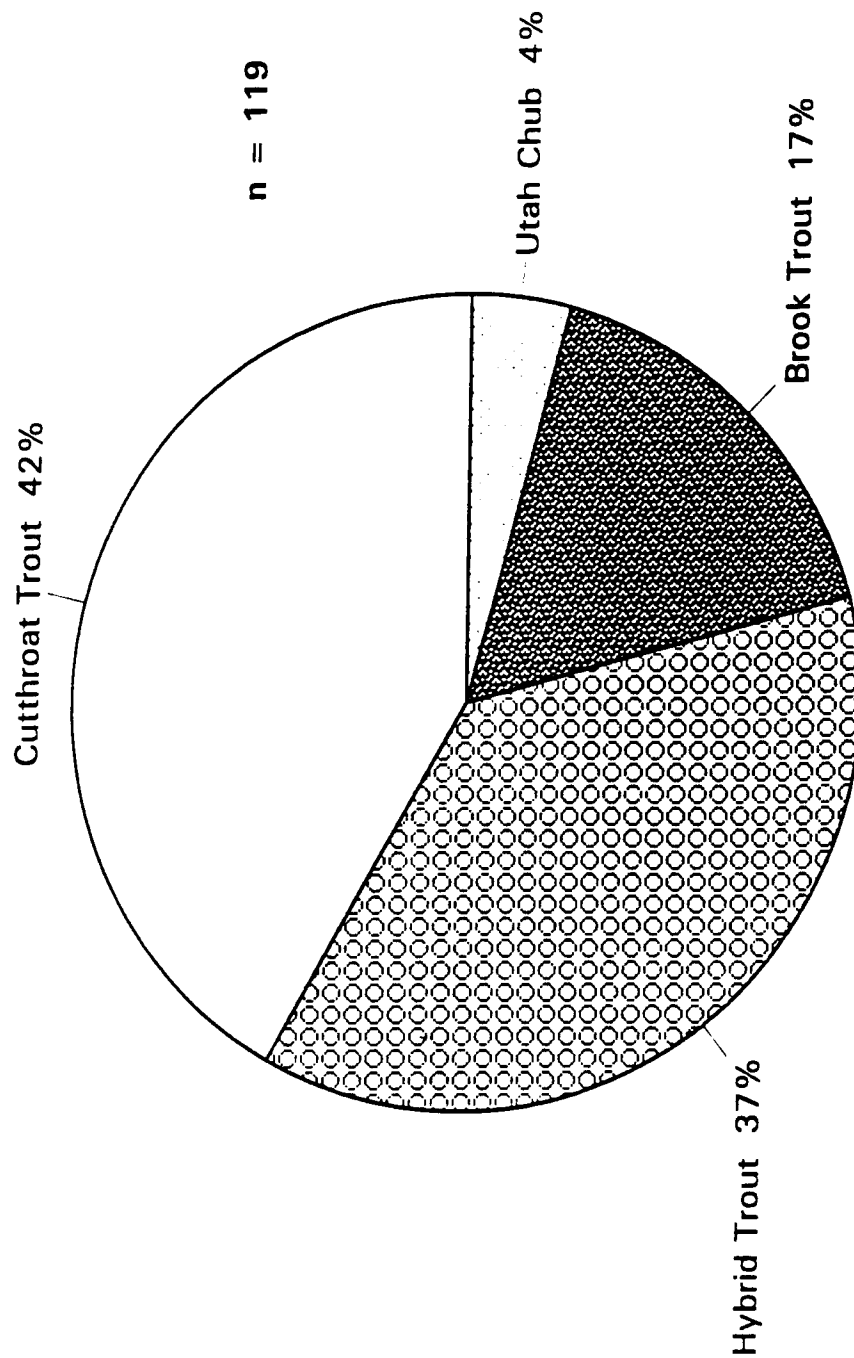


Figure 8. Example of dissolved oxygen depletion rates under ice in Henry's Lake, winter 1992, 1993, 1997, and 1998.

Table 5. Summary of sterile rainbow x cutthroat hybrid sampling data from the East Harriman Pond, August, 1997.

Fish sample number	Experimental group	Confirmed ploidy level	Total length (mm)
<u>1</u>	<u>treatment</u>	<u>diploid</u>	<u>248</u>
<u>4</u>	<u>control</u>	<u>diploid</u>	<u>263</u>
<u>6</u>	<u>control</u>	<u>diploid</u>	<u>241</u>
<u>7</u>	<u>treatment</u>	<u>diploid</u>	<u>233</u>
<u>11</u>	<u>treatment</u>	<u>diploid</u>	<u>303</u>
<u>13</u>	<u>control</u>	<u>diploid</u>	<u>270</u>
<u>14</u>	<u>treatment</u>	<u>diploid</u>	<u>288</u>
<u>15</u>	<u>treatment</u>	<u>diploid</u>	<u>276</u>
<u>16</u>	<u>control</u>	<u>diploid</u>	<u>250</u>
<u>17</u>	<u>control</u>	<u>diploid</u>	<u>268</u>
<u>18</u>	<u>control</u>	<u>diploid</u>	<u>245</u>
<u>19</u>	<u>control</u>	<u>diploid</u>	<u>241</u>
<u>mean length</u>			<u>260</u>
<u>2</u>	<u>treatment</u>	<u>triploid</u>	<u>297</u>
<u>3</u>	<u>treatment</u>	<u>triploid</u>	<u>300</u>
<u>5</u>	<u>treatment</u>	<u>triploid</u>	<u>266</u>
<u>8</u>	<u>treatment</u>	<u>triploid</u>	<u>291</u>
<u>9</u>	<u>treatment</u>	<u>triploid</u>	<u>231</u>
<u>10</u>	<u>treatment</u>	<u>triploid</u>	<u>278</u>
<u>12</u>	<u>treatment</u>	<u>triploid</u>	<u>273</u>
<u>mean length</u>			<u>277</u>





Appendix C. Species composition in six net nights of gill netting at Henry's Lake, May, 1997.

Appendix D. Winter 1998 dissolved oxygen concentrations at three standard sampling sites in Henrys Lake.

Location	Depth (m)	Dissolved oxygen (mg/l)		
		January 7	January 30	March 16
1 mile south of Pittsburgh Creek	ice bottom	9.3	9.2	7.7
	1	9.1	8.9	7.6
	2	7.5	7.9	5.3
	3	5.9	6.0	3.5
	4	4.0	5.2	1.7
	5	2.6	2.7	0.9
300 yards off county dock	ice bottom	9.4	8.2	5.2
	1	8.7	7.6	4.9
	2	7.4	4.8	4.0
	3	5.6	3.2	1.2
	4	3.2	1.1	0.6
	5	2.2	0.6	0.5
300 yards off Wild Rose	ice bottom	12.0	8.9	7.2
	1	12.0	8.5	7.1
	2	7.4	5.3	4.5
	3	6.5	3.6	2.5
	4	3.1	0.7	0.6
	5	2.4	0.5	0.4

## INTRODUCTION

The Mackay Fish Hatchery (MFH) is a specialty fish production station located approximately 12 miles north of the town of Mackay in Custer County, Idaho. The hatchery produces salmonids of various species and strains, from 1-inch to 16-inches in length, for statewide distribution. Funding is obtained under contract from the Federal Aid in Sport Fish Restoration Program, more commonly known as Wallup-Breaux, and from state license monies for fish feed and operational costs. Included in the years' production were 16 lots of fish, comprised of six species, and 11 different strains (Appendix 1).

Rainbow trout *Oncorhynchus mykiss*

Hayspur (ID)

Arlee (Ennis National Fish Hatchery, MT) (2 year classes)

Kamloops (Troutlodge, WA)

Cutthroat trout *O. clarki*

Westslope (McCall) (2 year classes)

Henrys Lake

Brown trout *Salmo trutta*

Plymouth Rock (Saratoga, WY) (2 year classes)

Crawford (Paint Bank Fish Hatchery, VA) (2 year classes)

Rainbow x Cutthroat trout hybrids

Henrys Lake ct females x Ennis NFH rainbow males

Kokanee salmon *O. nerka kennerlyi*

Early (Payette Lk.)

October (Roaring Judy Fish Hatchery, CO)

Grayling *Thymallus thymallus*

## WATER SUPPLY

Water for MFH production is provided by three collection springs in an artesian area at the MFH. The area is fenced off and has been dug out, then filled with cobblestone. The water volume available for MFH production remained consistent with previous years. Flows ranged from 18 to 24 cubic feet per second (cfs). Lowest flows occur during February, while highest flows occur during July. Since the 1983 earthquake, temperatures have varied between the three different springs supplying the MFH, one at 49°F, one at 51°F, and one at 54°F. Incubation temperature is 51°F.

## **HATCHERY IMPROVEMENTS**

Some projects completed around the MFH the past year include: building a tamper-proof cover over the spring headbox, gating the entry into the six-pack spring area, fabricating self-holding shade-screens for the large raceways, fabricating aluminum-framed and faced screens for the small raceways, radon abatement in all the residences, and a major cleanup of MFH property and local area.

Eighteen new nursery troughs have been financed, but the contracting company has failed to produce a satisfactory trough yet. We will either have new troughs, or our old troughs refurbished before spring arrives.

## **FUTURE NEEDS**

Residence #3 needs the old wood siding replaced. Two garages need to be built to replace residences #2's garage and to provide a garage for residence #3.

## **FISH STOCKED**

Fingerlings of various species and strains were stocked into six regions of the state (Appendix 2). These put-grow-and-take fish numbered 3,732,000, weighing 31,900 lbs.

Catchable rainbow trout (>8-in) were stocked in the Upper Snake and Salmon regions. These put-and-take fish numbered 95,200 and weighed 50,000 lbs. Catchable brown trout, numbering 5,000 fish and weighing 3,050 lbs, were planted into Horsethief Reservoir.

MFH transferred 3,200 catchables, weighing 1,100 lbs to Sawtooth Fish Hatchery, for planting into Pettit Lake.

The MFH also reared 22,150 cutthroat, 8,300 rainbow, and 3,750 grayling fry for planting into thirty-three high mountain lakes in regions 4 and 6. Four-wheelers, stock, foot and fixed-winged aircraft were used to plant these fish.

The fish transport trucks assigned to MFH traveled on 101 fish stocking trips during the year, logging 35,000 miles. Transport tankers assigned to Fish Transportation hauled four truckloads of fish for the MFH during the year.

## **FISH FEED**

Fish feed used during the year totaled 101,000 lbs at a cost of \$52,400. Feed conversion averaged 1.21 lbs of feed for every lb of fish produced. Feed cost per lb of fish produced was \$0.519.

BioDiet, Rangen, and Sterling Silver Cup feed were used, depending upon the stock of fish and specifications of the feed contract. All feeds used and amounts are shown in Appendix 3.

## **PUBLIC RELATIONS**

Approximately 800 people toured the MFH during the year. Most visitors come to fish in the diversion pond below the MFH. Scheduled tours were given to eight groups, including boy scouts, elementary school classrooms, and FFA groups. The MFH is assisting Mackay High School in an aquaculture program. The MFH crew and the local conservation officer participated in Idaho's "Adopt a Highway" litter control program. Six miles of Highway 93 along Mackay Reservoir are cleaned biannually. Assistance was also provided for the Hunter Education Program at Mackay School.

## **FISH MARKING**

Of the 1.2 million cutthroat planted into Henrys Lake, 85,000 were adipose-fin (AD) clipped prior to stocking. Of the 700,000 cutthroat/rainbow hybrids planted into Island Park Reservoir, 119,000 were adipose-fin clipped. A crew of three did the clipping during the second week of August.

## **ACKNOWLEDGEMENTS**

During 1997, the MFH crew included: Jason Rheinhardt, Adam Broussard and briefly, Mike Paddock, Biological- Aides. Without Jason and Adam's excellent assistance, much of the work mentioned above would not have been done. Their care and concern enable the MFH to produce the quality of fish we do. Mel Hughes, Fish Culturist, Mick Hoover, Assistant Hatchery Manager, and Phil Coonts, Hatchery Manager, round out the MFH personnel. Manpower expended totaled 36 permanent man-months and 13.5 temporary man-months.

Appendix 1. Fish production at Mackay Fish Hatchery, January 1 to December 31, 1997.

Species/Strain	Lot number	Source	Received as	Fish Number		Yield Number	Yield Pounds	Destination/
				Received or carried over	Pounds Received or carried over			
Hayspur rainbow trout	6-U-ID-R9	Hayspur	eyed eggs	10,366	28,600	98,300	51,000	97 catchables
Arlee rainbow trout	7-EN-RA	Ennis NFH	eyed eggs	143,000	71	91,000/	18,000	98 catchables
Arlee rainbow trout	8-EN-RA	Ennis NFH, Montana	eyed eggs	167,000	-	150,000	alevins	99 catchables
westslope cutthroat trout	6-U-ID-C2	McCall	fry	245,000	366	2,400	1,805	97 Payette Lake
westslope cutthroat trout	7-U-ID-C2	McCall	fingerlings	19,300	55	1,900	120	98 Payette Lake
Henrys Lake westslope cutthroat trout	7-U-ID-C3	Henrys Lake	eyed eggs	1,300,000	-	1,235,000	5,474	Henrys Lake, Reg 6&7, Mt. Lakes
Plymouth Rock brown trout	5-SR-BN	Saratoga NFH, Wyoming	eyed eggs	5,280	1,550	5,002	3,050	97 Horsethief Resv catchables
Plymouth Rock brown trout	6-SR-BN	Saratoga NFH, Wyoming	eyed eggs	188,000	alevins	157,000	1,600	97 Reg 4,5,6 fingerlings
Crawford brown trout	6-PB-BN	Paint Bank SFH, Virginia	eyed eggs	110,000	alevins	83,000	3,700	97 reg 4,5,6 fingerlings
Crawford brown trout	7-PB-BN	Paint Bank, Virginia	eyed eggs	360,000	-	5,000	1,400	98 Horsethief
rainbow x cutthroat	7-U-ID-RC	Henrys Lake	eyed eggs	1,000,000	-	320,000	alevins	98 Reg 4,5,6 fingerlings
Deadwood kokanee	6-U-ID-KE	Deadwood Reservoir	green eggs	70,000	-	998,000	8,550	Island Pk, Henrys Lk, Horsethief
Blue Mesa kokanee	6-U-CO-KO	Roaring Judy, Colorado	eyed eggs	1,300,000	-	1,182,000	800	97 Deadwood Resv
Payette Lake kokanee	7-U-ID-KE	Payette Lake	green eggs	700,000	-	1,182,000	9,000	97 Reg 2,3,4,6 fingerlings
grayling	1-7-GR	Ashton Hatch.	fry	6,500	-	500,000	alevins	98 fingerlings
Kamloops trout	7-Y-WA-K1	Troutlodge, WA	eyed eggs	25,000	-	6,250	6.5	Reg 4,6 high Mt. Lakes

Appendix 2. Mackay Fish Hatchery Stocking Summary, 1997.


Not Number	# Planted	Lbs Planted	Size Planted
6-U-ID-R9	95,229	49,923	catchable
	3,190	1,100	catchable
7-EN-RA	52,480	1,640	fingerling
7-U-ID-C3	1,234,520	4,171	fingerling
7-U-ID-RC	998,350	8,797	fingerling
6-SR-BN	156,520	1,605	fingerling
6-PB-BN	83,505	3,175	fingerling
5-SR-BN	5,002	3,050	catchable
6-U-ID-C2	24,000	1,805	fingerlings
6-U-ID-KE	29,600	800	fingerlings
6-U-ID-KO	1,182,225	9,885	fingerlings
7-1GR	3,750	2.4	fry
7-K1	15,800	13.6	fry
7-U-ID-C3	22,150	17.9	fry
FingerlingsTotals	3,776,200	31,900	
High Mtn. Fry Totals	34,200	34	
<b>Catchables</b>			
Planted	98,419	52,970	
Transferred	3,190	1,100	
<b>Totals</b>	<b>3,912,009</b>	<b>86,004 pounds</b>	

Appendix 3. Mackay Fish Hatchery Fish Feed Used January 1, 1997 through December 31, 1997.

	<b>Lbs Used</b>	<b>Cost</b>
<b>Bioproducts Biodiets</b>		
Starter #1	1,037	\$ 1,348.00
Starter #2	3,790	\$ 4,927.00
Starter #3	6,813	\$ 8,857.00
Grower 1.0	4,268	\$ 5,548.00
Grower 1.3	5,236	\$ 5,550.00
Grower 1.5	2,904	\$ 3,078.00
Grower 2.5	44	\$ 41.00
Sub-Total	24,092	\$ 29,349.00
<b>Silver Cup Feeds</b>		
Fry Crumble 1.0	2,000	\$ 800.00
Fry Crumble 2.0	1,500	\$ 570.00
Pellets 3/32	5,000	\$ 1,350.00
Pellets 1/8	12,500	\$ 3,375.00
Pellets 5/32	50,000	\$ 13,500.00
Sub-Total	71,000	\$ 19,595.00
<b>Rangen Products</b>		
Trout Starter #2	850	\$ 501.00
Trout Starter #3	4,000	\$ 2,360.00
Trout Grower #4	1,100	\$ 634.00
Sub-Total	5,950	\$ 3,495.00
<b>Total</b>	<b>101,042</b>	<b>\$ 52,439.00</b>



Approved by:



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Virgil K. Moore, Chief  
Fisheries Bureau



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Bill Hutchinson  
State Fisheries Manager



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Tom Frew  
Resident Fish Hatcheries Supervisor